OBSERVATIONS ON A SO-CALLED PETRIFIED MAN.

By J. M. Stedman.[1]

With a Report on the Chemical Analysis.

By J. T. Anderson.[2]

On the 28th day of August, 1894, a human so-called petrified body was found by some workmen while repairing a public country road about one mile south of Tuskegee, Macon Co., Alabama. A few days later I heard of the find, and immediately proceeded to Tuskegee to make an investigation of the body and of the locality where it was found, and to obtain samples of the water, earth and body.

Through the kindness of Mr. J. S. Webb, who had the body in charge, I was enabled to make an examination on, and to procure portions of the body from the several places as samples. As Mr. Webb was trying to sell the body as a curiosity, he did not wish me to mutilate it any more than was necessary. I obtained, however, portions of the intestine, a section 75 x 25 mm. through the ventral abdominal wall, several pieces of muscle with tendon from the ankle, and a section 100 x 100 mm. was cut out from the dorsal region of the thigh and extending to the bone in thickness. Mr. Webb, by the way, offered me the body for the college museum for $75, but, as I hoped to be able to procure it later as a donation, I refused. He sold the body in a few days for $150, and it is now being exhibited in the villages and cities of the country, much to my regret.

The body is that of a Negro woman who was evidently rather fat. From two elderly gentlemen, who are now living in Tuskegee, and who remember the circumstances of the burial, I learned that the body was buried in 1837 in what was

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then a small neglected country or family burying-ground, situated a few rods from the road. They also remember the burial, at about the same time, of an Indian but a few feet from this Negro; and I am trying to have the Indian dug up to ascertain whether it is likewise preserved or not.

In company with several citizens of Tuskegee I drove to the scene of the find. The burial ground is near the top of a very large flat hill or plateau, and a few rods south of the grave is a small marshy or swampy bog, while some seven meters to the east there is a spring. Several years ago the public road was moved a few rods to the south in order to give it a better grade up the hill, and as the small, neglected burial ground had not been and was not worth keeping up, and was no longer used as such, the road was cut through a portion of it; and most people had now forgotten about its existence. The road was cut about one meter below the surface, and the ditch at the side was directly over the Negro woman's body, and served to carry off the water from the spring just above. The result was that the body lay but about one-third of a meter below the ditch, and the water from the spring kept it continually wet, even when no water appeared on the surface. While the workmen were repairing the road and picking in the ditch, they hit something that proved to be a pine board. On removing it they came upon others, which they removed, and thus exposed a plain pine coffin in a remarkable state of preservation.

The soil where the body was found is sandy, with enough fine, light-colored clay and moisture to give it the appearance of mortar. When a portion of the soil was dried, it held together with great tenacity, and the dirt left on one's hands became nearly white on drying, and felt smooth and slippery like powdered talc; in fact, I could detect no difference as regards looks or feeling. Portions of the soil had streaks of red color, probably due to iron. The hole left by the removal of the coffin soon filled with water, the soil being extremely wet, although very little moisture appeared on the surface on account of excessive dry weather. The water had a decided milky appearance. I obtained samples of the soil from the bottom of the hole, from the sides, and from the earth just

above; and also samples of the water from the hole. These were placed in thoroughly clean jars brought for the purpose.

The first thing to be noted is the fact that the boards that covered the coffin, as well as the coffin itself, were in a perfect state of preservation—not a sign of decay was to be found. They looked like newly-planed boards that had been exposed to the weather for about six months; just long enough to partially color the wood gray. The nails in the coffin had all rusted away.

On opening the coffin, the body of the Negro woman was found to be in a remarkably good state of preservation. Of course it was saturated with water, but, nevertheless, it was firm like hard cheese, so that the workmen pronounced it petrified when they touched it, and found it would not give or bend. In general, the body at first glance has very much the appearance of sheet asbestos, being dirty-white in color, with a certain grain in places, due to the connective tissue in the fat where the skin is wanting. The abdomen and to a certain extent the thorax is swollen and bloated, so that part of the abdomen pressed tight against the top of the coffin, thus showing that decomposition had started when the body was first buried, and had continued for a short time. It is to be noted that no part of the body was decomposing when found, and it has shown no signs of doing so since; neither does it smell—all decomposition that had taken place was now checked. The head is not well preserved, part of the cranium having been decomposed, and other parts partially so, and more or less separated. All the hair, with part of the scalp is, however, well-preserved, while the face had been partially decomposed. One wrist and both ankles had been badly decomposed, and part of the feet and one hand slightly decayed. Some of the toe and finger-nails were perfect, others partially or wholly decayed. The rest of the body is practically intact and well-preserved, except that in places the skin is wanting; but this does not make itself apparent to the ordinary observer.

With a scalpel I cut through the ventral abdominal wall from right to left, and then cephalad at the two ends. The body at this place cuts very much like dense cheese. The cut

portion was then lifted up and turned back, thus exposing the viscera beneath. The intestines, and in fact all the viscera, were only partially preserved. They had become more or less decomposed, and had then been checked in their decomposition and preserved in that state from further change. There was no particular smell from the abdominal cavity, and no decomposition was in progress. The intestines were moist, loose and pliable, and the fœces still preserved in them. All the viscera were light in color, due to the partial deposition in them of the finely-suspended, and perhaps more or less soluble, mineral matter in the water that filled and covered the body. The deposit of this mineral matter was not in sufficient quantity to give the tissue much firmness.

The abdominal wall which was cut through in order to examine the viscera, was 30 mm. thick, and owed its dense, cheese-like consistency and firmness to the deposition in it of the finely suspended mineral matter contained in the water that constantly saturated the body. The abdominal wall was practically completely charged with the mineral matter, while the process of filling the viscera had but nicely commenced. The mineral matter was extremely fine and of a light or almost white color, and thus it was that the body appeared light. So far as I was able to determine, this mineral matter in the tissues of the body is the same as that held in suspension in the water, and which gave it the milky appearance; and also that which in the soil or sand gave it the appearance of mortar, and that when dry, looked and felt exactly like powdered talc. With the exception of the fat, the tissues of the abdominal wall were practically intact, the mineral matter simply saturating them and filling up all the spaces; in the fatty tissue, however, which composed a large part of the abdominal wall at this point, there had been more or less substitution of the mineral matter for the fat. This substitution was, roughly speaking, about half and half. Hence it was that where the skin was wanting, there appeared a grain, due to the connective tissue remaining, while the fat was partially substituted. Wherever the skin was preserved, the black pigment could be distinctly seen in a cross-section.

In cutting and then removing the 100 x 100 mm. piece from the back of the thigh, I was surprised to find that the deposition of mineral matter had taken place to the extent of 25 mm. in depth, and that from this point inward the muscular, connective and other tissues were in such a perfect state of preservation, that they looked and felt exactly like fresh corn-beef. The flesh or muscle was of a dark red color, and of a perfectly natural and fresh consistency, showing no signs whatever of having undergone the slightest decomposition; it did not emit any more odor than fresh meat. The perimyseum appeared perfectly natural, the tendons glistened as well as the perimyseum near them, and the connective tissue was, to all appearances, as strong and well preserved as one could expect to find it in a body dead but twenty-four hours. On teasing the muscles, the fasciculi held together perfectly naturally, and the only difference besides color that I could then detect between this muscle and a perfectly fresh one was that this appeared to have a little more firmness, but it was very slight, and if compared with fresh corn-beef this difference disappears. It is also to be noted that the external layer, averaging 25 mm. in thickness, where the deposit and substitution of mineral matter had taken place so completly, and which covered the entire body and gave it its consistency, that this region was quite sharply marked off from the region below. In other words, the deposition and substitution of mineral matter had taken place to the extent of about 25 to 30 mm. in depth all over the body (wherever examined it was of this depth), and rendered this portion very dense, tough and firm; and, instead of gradually merging into the soft almost unchanged inner portion, the change was quite abrupt. From an examination of the abdominal wall, I at first supposed this abrupt and sudden change to indicate and be due to the region of fatty tissue, but I found, on further examination, that the abrupt change took place in the muscular tissues of the thigh, where little or no fat was to be found.

On reaching my laboratory, I made a microscopical examination of the samples of tissue by means of sections and teased preparations, in order to determine the extent of the preserva-

tion of the histological structures. I found that the skin was nearly substituted by mineral matter in most places, and in some wholly substituted. The fatty tissue was also substituted by mineral matter to the extent of about 50%. The muscular tissue, where the deposit of mineral matter was greatest, did not seem to have been replaced to any considerable extent, but was simply saturated with the deposit. Where the muscles were still soft, the fasciculi, and even the fiber cells with their striæ, were remarkably well preserved and easily demonstrated. The perimyseum and tendons were practically perfect. The connective tissue was surprisingly perfect, the only change being the loss of the connective tissue corpuscles in many places; but even these were found in the better preserved soft muscular tissue. The nerves were not well preserved histologically. The blood-vessels in the soft muscles were fairly well preserved; the blood-corpuscles were not to be found. The periosteum and the bone was perfect, except in those regions like the head and ankles where decomposition had taken place.

I then examined, by the agar-agar plate culture method, the muscular tissue for bacteria, and found none. The water taken from the hole, left by the removal of the coffin, also failed to reveal the presence of bacteria on an agar-agar plate culture of 1 cc. of the water.

A piece of the soft muscular tissue from the thigh was then placed in a museum jar of water from the grave. This jar was opened every few days for more than a month, and the muscle taken out to show it to visitors. The water, jar or muscle had not been sterilized; no caution was taken, in opening the jar, to close it for some minutes, nor to protect the piece of flesh. I did this in order to determine how long it would keep under those conditions, and I therefore watched it and made examinations from time to time. To my surprise, the piece of muscle is this day, the 15th of December, 1894, of a reddish color and looks quite natural, but I now find, on examination, that it is becoming softer, and that bacteria have made their ap-

pearance, so that the tissue will ultimately decompose[3]. It was this test that I wished to finish that prevented me from publishing this article just as soon as the chemical analysis was completed.

The large piece cut from the thigh was placed in an empty museum jar in order to keep it as moist and natural as possible, and to observe how long it would thus resist decomposition. The piece was frequently taken out of the jar to allow visitors to examine it. I found, in about two weeks, that a small mould was making its appearance on the surface, and I then cut it in halves, and placed one in alcohol and the other on my table and allowed it to dry. Of course the specimen in alcohol is preserved, although it does not look natural; it has become darker colored, and the flesh has shrunken and become harder, while the hard external region of greatest deposition of mineral matter has become much softer. The specimen exposed on the table dried in a few days with the usual changes, and is now preserved in that state, and shows no signs of moulding or decaying. The entire body is now dry, and will keep, no doubt, indefinitely in that condition.

Of course the greatest interest attaches itself to the question of the cause that checked decay and preserved this body for 57 years, with the certainty, I might say, of doing so indefinitely, and, perhaps, of ultimately converting it into a hard fossil by substitution. It was with this object in view that I obtained samples of the water and earth from the grave, and gave them to Dr. Anderson for chemical analysis, and also portions of the body itself for chemical analysis. And, now that the analysis of all these has been made, I must confess I do not see my way clear. I cannot understand why decomposition should not have continued on the inside until the viscera and muscles were obliterated. The body seems to have acted like a filter, and to have taken out and held in itself the finely suspended, and perhaps also some soluble mineral substances in the water. This filtration naturally saturated the

[3] Since writing the above the proof has just reached me (11th of March, 1895), and as nearly three months have elapsed since the observation was made, it may be of interest to note that I have kept the sample of flesh on my desk ever since, and that it is to-day only partially decayed.

external layers of tissue first, and, when found, had not extended far inside. I think I can understand, then, why it is that the external tissues are preserved, but I do not understand the preservation of the inner tissues. I do not believe that the small amount of lead found in some portions of the body itself can account for the preservation. Can it be that the silica, alumina and oxide of iron held in suspension, and the silica, lime and magnesia in solution in the water could have prevented decomposition? The three ingredients, silica, alumina and magnesia constituted the bulk of the mineral substances deposited in the tissues, and that near the periphery, was in sufficient quantities to give it a firm consistency. The soil contained nearly 3% soluble silica, and the water contained a large percentage; but can this account for the preservation? The observed fact is that the body was preserved and decay completely checked, and I can only account for it by saying that the combined action of all the ingredients of the water—silica in suspension and in solution, alumina and oxide of iron in suspension, and lime and magnesia in solution—is to be looked upon as the cause.

And, what is still more obscure, is the fact that the body was buried with a shroud (or some clothes), while all that now remains of it is the imprint nicely stamped on that part of the abdomen that had swollen and pressed closely against the lid of the coffin, and also on the lid of the coffin where some of the mineral matter is adhering. Every thread of the cloth is as plainly visible in the impression as it is possible to make them with plaster casts. It appears to have been a cotton sheet, but not a fiber of the original cloth is to be found. Now, why was this cloth not preserved? If it was cotton cloth, its chemical composition was practically the same as that of the pine coffin which was perfectly preserved; if the cloth was woolen (there can be but little doubt that it was cotton), its chemical composition was practically that of the hair which was also perfectly preserved. I cannot account for this to my own satisfaction, and will offer no suggestions; to me, this is more difficult of explanation than the preservation of the body.

Through the kindness of Dr. Anderson, First Assistant Chemist on the Experiment Station, who made the chemical analysis of the water, soil and body, I am enabled to submit herewith his report on the same:

With a view of determining the agency by which the body was kept in so excellent a state of preservation, the soil in which the body was buried, the water which percolates through the soil from the spring above, and the flesh from the body itself were all subjected to chemical analysis.

The soil presents no peculiarity in its composition, further than it is a highly silicious soil. It contains 95.91% of insoluble residue, and 2.94% of soluble silica, thus giving nearly 99% of silicious matter. Next in importance as regards quantity comes alumina and oxide of iron—nearly 1%—and then lime, magnesia, and the alkalies in minute quantities.

When found, the coffin containing the body was submerged in water, and when the coffin was removed, the hole soon filled with water. A sample of this water was taken for analysis. After remaining in the bottle undisturbed for four or five weeks, a considerable sediment, chiefly of sand, formed in the bottom, but the supernatant liquid remained decidedly milky in appearance. The suspended matter which caused this milkiness was found to be silica and alumina, with oxide of iron. The water presented no other peculiarity, but contained lime and magnesia.

Naturally, the chief interest attaches to the chemical examination of the flesh itself. To preserve the specimen in the condition in which it was found, it was kept in a bottle with a ground glass stopper. Determinations were made of water, fat, organic matter other than fat, and ash. From a number of determinations the following averages are taken: Water, 55%; organic matter, 44%, 32% of which was fat; and ash, 1.22%. The least amount of mineral matter found was 0.33% and the largest, 2.10%. It was found to contain silica, alumina, oxide of iron, lime and magnesia. But, in my estimation, the most important find was lead. This was not found uniformly distributed throughout the specimen. From two to three grams of the flesh were used in each determination. In

two of these samples not a trace of lead could be found; in three or four others a perceptible quantity was obtained, while in one a sufficient quantity was gotten to make a metallic bead. There can be no doubt, therefore, that lead in some form exists in the body. It was found in a part of the specimen which had been kept several weeks in alcohol, and hence must have been incorporated with the tissues of the body.

Whether lead was the sole agency in the preservation from decay, I cannot say; but that it exerts an influence in that direction cannot, I think, be doubted. It is recorded that a solution of sugar of lead, among other things, were used as an embalming fluid during the Civil War. It is hardly probable that the body in question was embalmed, as it is that of a Negro; but some salt of lead may have been administered as a medicine. It is well-known that lead is a "cumulative" in its nature—that is, when taken into the system from time to time, even in small quantities, it is not thrown off as is usual, but is retained in the system and thereby accumulates. May not the presence of lead in the body under examination be accounted for in this way? It is a matter of regret that reliable facts relating to the history of the case before us are unattainable.